

misdirected employs its half-dormant energies in the gratification of the bodily instincts. Hence the wickedness of man as contrasted with the innocence of the brute creation.

According to this view, the reasoning power in the lower animals may be cultivated to a far greater extent than is generally supposed, thus opening a wide field of instruction and pleasure to the true naturalist, who knows that God's works are great—"sought out of all them that have pleasure therein."

ART. V. ON AGATES. BY A. S. FOORD.

(Read February 14, 1870.)

ENCOURAGED by the very flattering reception accorded to my paper on "Gems," which I had the honour of reading before the Institute in February last, I have been induced once more to take up my pen and pencil, trusting that my endeavours on this occasion also, may not be unsuccessful.

Agates are among the most attractive objects that grace the cabinet of the collector. The variety of colours which they present, and the brilliant polish of which they are susceptible, enhance their value, while they display to advantage the exquisite markings so characteristic of the agate.

In some groups the colours are distributed in clouds, spots, or concentric lines: in others in bands of various hues, as in *Ribbon Agate*; while in not a few the markings are produced by parallel deposits of chalcedony—represented in that variety called "*Fortification*" *Agate*, in which some of the layers are zig-zag, like the lines of a fortification. Agate is a variety of *chalcedony*, and often occurs lining or filling cavities in amygdaloidal and other rocks, or scattered over the surface of the soil, or in the beds of torrents and rivers.

The agate derives its name from that of the river Achates in Sicily, whence, according to Theophrastus, it was first brought. The most common kinds are of a light greyish-blue or dove colour, passing into deeper shades of blue.

In examining a section, such as Fig. 1, it will be seen that the deposits of chalcedony, (which are usually concentric), commence with a small spot or nucleus in the centre of the amygdaloid, increasing in diameter as they approach the sides of the cavity, with spaces varying in width between each deposit.

“The origin of the amygdaloidal structure cannot be doubted, for we may trace the process of its formation in modern lavas. Small pores or cells are caused by bubbles of steam and gas confined in the melted matter. After or during consolidation, these empty spaces are gradually filled up by matter separating from the mass, or infiltrated by water permeating the rock. As these bubbles have been sometimes lengthened by the flow of the lava before it finally cooled, the contents of such cavities have the form of almonds.

“Amygdaloid comprehends any rock in which round or almond-shaped nodules of some mineral, such as *agate*, chalcedony, calcareous spar, or zeolite, are scattered through a base of wacké, basalt, greenstone, or other kind of trap.”*

Mr. Jackson describes, in the following terms, the appearance of “*Eyed Agate*” and *Ribbon* or *Banded Agate*:—

“Some agates seem to have been formed by a bundle of cylinders enveloped in a sicilious paste, the cylinders themselves being formed of concentric accumulations. When such an agate is cut in a direction perpendicular to the cylinders, it exhibits a multitude of circular figures, bearing some resemblance to the iris and pupil of the eye,—whence this kind is called *Eyed Agate*; but if the stone be cut in a direction parallel to the axes of the cylinders, we have a suite of more or less delicate parallel lines, in which case it forms a *Ribbon* or *Banded Agate*.”

Moss Agate or *Mocha Stone* is generally of a brownish colour, translucent at the edges, and having a very distinct conchoidal fracture, and sharp cutting edge; the moss-like or dendritic markings are opaque and of a yellowish-brown colour. They are caused by oxide of iron, disseminated in efflorescent particles here and there throughout the mass.

Dr. Bowerbank, some twenty-five years since, investigated the subject of agates with much success, and has shewn that the heliotrope (*bloodstone*) of India, and many of the so-called moss-agates, are due to a spongy nucleus.

*Sir Chas. Lyell's “Elements of Geology.”

Agate-jasper, as the name implies, is a blending of agate and jasper, in patches or veins of various thickness,—the jasper usually predominating. The author possesses a specimen in which a brown jasper (as figured), is intersected by a broad vein of agate; the jasper being also traversed by narrow veins, which mingle with the large vein of agate by means of channels or inlets. These red veins are owing to the action of heat, which has rendered the iron contained in the jasper *anhydrous*.

The drawing numbered 1, represents a section, viewed edge-ways, of an amygdaloid, popularly known as Fortification Agate, wherein is displayed that interesting phenomenon to which I have alluded, namely, infiltration. In this specimen the chalcedony apparently entered the amygdaloid, and penetrated the regular layers from the upper part of the geode, forming the lines of the fortification, resulting in the cloudy appearance observable in the stone.

Brecciated agate or *breccia agate* consists of fragments of *jasper*, *bloodstone*, *carnelian*, &c., cemented by a paste of chalcedony.

Agates are found in great abundance in different parts of the world, especially where trap rocks occur.

They are met with in great variety at Oberstein,* near Coblenz (in Rhenish Bavaria), in a rock of amygdaloid of a peculiar nature, and full of cavities of all sizes.

Some very beautiful articles were exhibited at the Exhibition of 1851 from the above locality, and obtained prize medals.

The agate trade at Oberstein and Idar has lately undergone a singular change, in consequence of a falling off in the supply of the agate nodules. The agates now worked in that district, and sold as native productions, are chiefly obtained from the Brazils, where, (on the Paraguay, brought down from the interior by the Rio de la Plata,) they are in such abundance as to be shipped for ballast.

*Oberstein is beautifully situated on the left bank of the Nahe, shut in by high and romantic cliffs, chiefly of porphyry and amygdaloid, abounding in agates and crystals. The existence of these probably gave rise to the importation of other half-precious stones, of finer quality, from the East Indies and Brazil, *in the rough*, which are here cut and polished. This business occupies a considerable number of the 3000 inhabitants. The stones are ground and polished by means of grinding-stones of red sandstone, moved by water-wheels in numerous small mills scattered along the neighbouring streams. There are large polishing mills at Idar, one-and-a-half miles off. Close to Oberstein are two fine precipitous rocks, &c. — *Murray's Hand-Book—Northern Germany*.

Notwithstanding the source of supply is so remote, agate articles are sold in Germany at prices astonishingly low. One other fact in connection with the agate frauds may be worth recording. Upper Egypt is known to yield agates, though different from those of South America, and much less abundant. Travellers from Europe in passing through that country enquire for these; and, to meet the demand, Brazilian agates are now sent to Egypt, and there sold for Egyptian agates. At Cairo, especially, numbers are thus disposed of to English and other travellers, who purchase them as souvenirs of the country.

India furnishes many of the finest specimens, where they are largely employed in the decoration of the celebrated Mausoleum of the favourite wife of the Mogul Emperor Shah Jehan. This unique monument is internally surrounded with borders in the form of garlands of exquisite taste, entirely composed of agates, jasper, carnelian, lapis lazuli, &c.; the stones being let into the white marble in the manner of the Florentine Mosaics. The agates, &c., used, are said to be the produce of different countries of India, and are of the finest quality.

The occurrence of agates in Scotland will be familiar to all who identify them with the pretty "Scotch Pebbles," set in silver, and made into brooches, bracelets and other ornaments.

Alger (the American Mineralogist) observes that "specimens recently brought from Nova Scotia will vie in beauty with any from the most noted localities."

I have in my own collection a handsome piece of moss-agate from Five Islands, in the Bay of Fundy, whose shores abound, in certain spots, with the finest specimens of this attractive stone. I have attempted to pourtray the above named fragment, in the drawing numbered 2, but with, I fear, small success. The rich colour and varied surface of the mineral, added to its semi-translucence, make it most difficult to represent in a diagram, with any degree of accuracy.

Many jewellers colour agates artificially by placing them in a solution of oil, (of 200° temperature); after reducing it to 60° they are transferred to a vessel containing sulphuric acid, which decomposes the red sulphate of iron, changing the stone from a pale grey, or dove-colour, to a rich brown or black tinge.

Some agates are very curious, in as much as they represent, frequently with remarkable accuracy, faces, figures and other objects. Pliny speaks of an agate belonging to King Pyrrhus which represented the nine muses with Apollo in the midst holding a lyre; the whole being most perfect, though a mere freak of nature. Majolus informs us that there is in Venice an agate on which is the figure of a man thus drawn by the hand of nature. It is also said that in the Church of St. John, at Pisa, there is a stone of the same kind, representing an old hermit in a desert, seated on the banks of a stream, and holding in his hand a little bell, just in the way St. Anthony is generally painted. These singular accidents are not, however, peculiar to the agates. There is in the British Museum an Egyptian jasper broken in two, and on each piece is a profile of Chaucer the poet.

But however curious these freaks of nature may be, and however pretty, being only accidental, they are far less interesting to the mineralogist and the true lover of nature, than those forms which are her ordinary production.

We must, I think, turn to chemistry for satisfactory accounts of the formation of agates, but if any of the members of our excellent Institute feel an interest in the subject they have ample means of prosecuting their researches in Nova Scotia.

LONDON, Dec., 1869.

ART. VI. NOTES ON IRON DEPOSITS ON EAST RIVER IN THE COUNTY OF PICTOU, N. S. BY REV. D. HONEYMAN, D. C. L., F. G. S., *Member of the Geological Society of France, &c.*

(*Read March 14, 1870.*)

THIS subject cannot be said to be new, as Dr. Dawson, and writers on geology who have derived their information more or less from his writings, have repeatedly directed attention to the subject. In a report of a Geological examination of certain districts in Nova Scotia made by the authority of the Provincial Government, I made observations on one of the deposits, and in a letter to the